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# BEHAVIORAL CONCOMITANTS OF COLD ADAPTATION: II. RATE OF RESPONDING AT -5° C*

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## ABSTRACT


### BEHAVIORAL CONCOMITANTS OF COLD ADAPTATION: II. RATE OF RESPONDING AT -5° C

**OBJECT**

To Determine whether the previously reported difference in rate of responding between normal and acclimatized rats in an operant conditioning situation with radiant heat as reward occurs at another low ambient temperature.

**RESULTS**

Acclimatized animals responded more frequently than normals when both were tested at -5° C, thus extending the results of the earlier study done at 2.5° C.

**CONCLUSIONS**

The demonstrated behavioral difference has been found at two different low ambient temperatures, which indicates that the phenomenon is likely to occur at other low temperatures. Such a behavioral index of acclimatization can be used to investigate the nature of the adaptation process.

**RECOMMENDATIONS**

Further research on the effects of different testing temperatures, various reward durations, different schedules of reinforcement, and on the time course of development of behavioral differences between normal and acclimatized animals is indicated.

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# BEHAVIORAL CONCOMITANTS OF COLD ADAPTATION: II. RATE OF RESPONDING AT -5° C

## I. INTRODUCTION

A previous study (2) designed to determine whether orderly changes in behavior accompany the process of cold acclimatization indicated that in an operant conditioning situation with radiant heat reward, animals acclimatized and tested at 2.5° C responded more frequently than normal animals tested at the same temperature. It was suggested in this earlier study that because of the complex relationship between duration of reward, ambient testing temperature, and response rate reported by McCleary (1), the results obtained at 2.5° C may not have been representative of results obtained at other testing temperatures. The present study is an attempt to determine whether another ambient testing temperature (-5° C) leads to the same behavioral results as those demonstrated earlier.

## II. EXPERIMENTAL

### A. Apparatus

The operant conditioning apparatus was the same conventional system used in the previous study (2). Briefly, the apparatus consisted of a system capable of producing regular or 3:1 ratio reinforcement by means of programming and timing units. Responses were recorded on an Esterline-Angus operations recorder. The reward was a 5-second exposure of radiant heat from a 250-watt infrared bulb placed directly over the head and shoulders of the animal when it pressed the response lever.

Two separate cold rooms were used to produce the acclimatization ($2.5 \pm 1.5$° C) and testing ($-5 \pm 2$° C) temperatures.

### B. Procedure

Two groups of male albino rats, shaved over the neck and shoulders as described in the previous report (2), were used as subjects. The control group (N=9) lived in the animal colony room at approximately 22° C except for the test periods. The experimental (acclimatized) group (N=9) lived in individual cages in a cold room at 2.5° C for the duration of the experiment, except for the test periods. Both groups received food and water ad libitum except during test periods, when neither was available to them.

For the first 10 days of the experiment the animals lived in their respective ambient temperatures with no behavioral measures taken. On the eleventh and twelfth days, each animal received a 30-minute session of habituation to the box at the testing temperature of -5° C. On the thirteenth and fourteenth days, operant level was measured in 30-minute sessions at the low temperature. Regular reinforcement was administered on days 15 and 16, followed by 4 daily sessions of 3:1 ratio reinforcement. All reinforced sessions took place at -5° C and lasted 30 minutes.

## III. RESULTS

The mean response rates for the 2 groups of animals are shown in Figure 1. Each mean is based upon 9 subjects except for day 17 (the

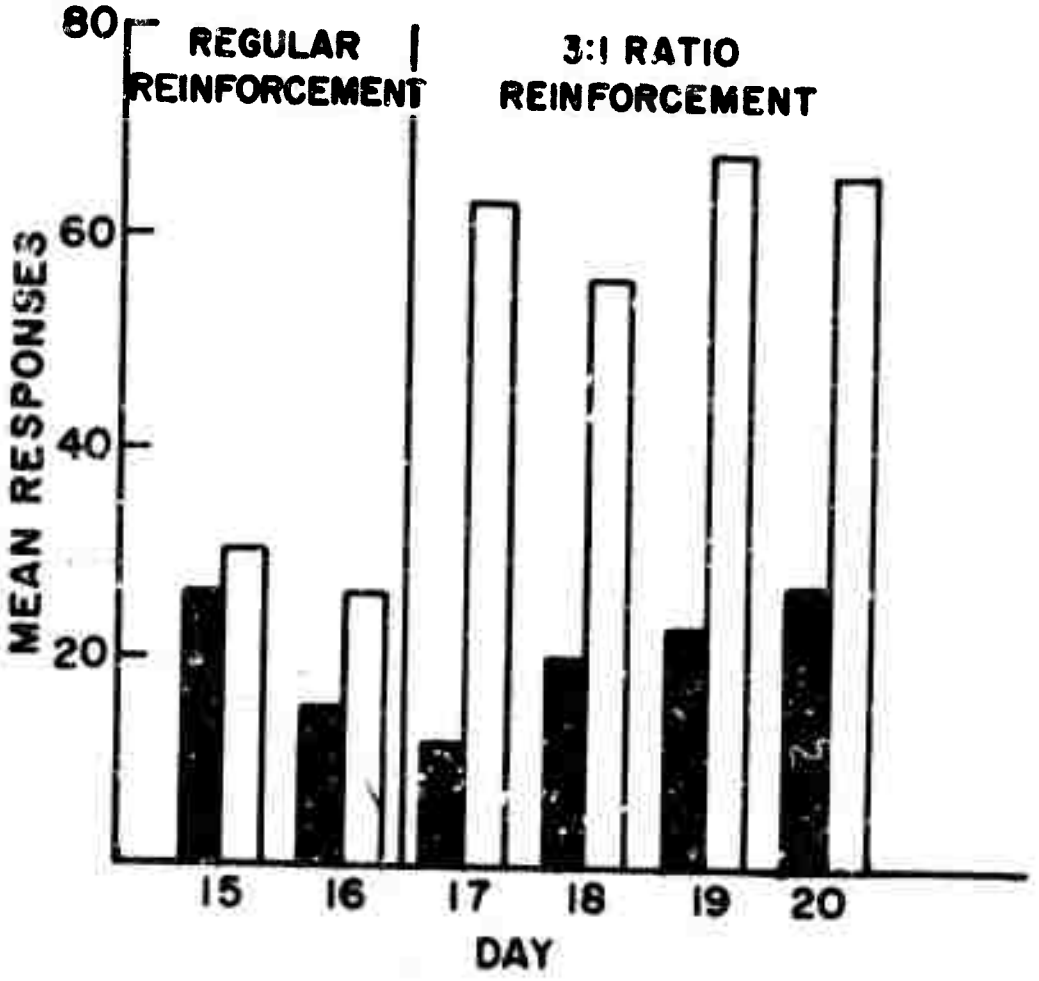


Fig. 1. Mean response per session for normal (black) and acclimatized (white) groups of rats under 2 schedules of reinforcement at -5° C.

first day of ratio reinforcement), when an equipment failure caused the loss of data for one animal in the normal group. The results depicted in Figure 1 are very similar to those found in the earlier study (2). The acclimatized animals have a considerably higher rate of responding than the normals, although the day-to-day regularity within the acclimatized group which was so marked in the earlier experiment is not so pronounced here. The mean response rate of the normal animals appears to be increasing steadily during ratio reinforcement.

## IV. DISCUSSION AND CONCLUSIONS

The results of this study are in accordance with the findings of the previous experiment (2). The possibility that an unfortunate combination of ambient temperature and reward duration accounted for the observed differences in the earlier study is lessened by the present findings. It appears from these 2 studies that a behavioral difference between normal and acclimatized animals does exist.

The trend toward higher response rates in the normal group as the experiment progressed indicates that perhaps the animals would have shown postive evidence of learning if this schedule of reinforcement were continued long enough. No such trend was evident in the earlier study at a higher testing temperature, which suggests that the present lower temperature is beginning to reach the range where normal animals would be sufficiently motivated to respond frequently. This possibility can be explored experimentally.

While the present study has done nothing to clarify the mechanisms through which behavioral differences occur between normal and acclimatized animals, it has shown that the differences are present at another ambient testing temperature and hence are probably not artifacts of the particular combination used in the first study.

## V. RECOMMENDATIONS

Further research on the effects of different testing temperatures, various reward durations, different schedules of reinforcement, and on the time course of the development of behavioral differences between normal and acclimatized animals is indicated.

## VI. BIBLIOGRAPHY

1. McCleary, R. A. Personal communication.

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